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What is claimed is:

1   1.   A system comprising:
2   a plurality of data centers, including a first data center and a second data
3   center, each data center comprising:
4   a storage system; and
5   a host server;
6   a directory server;
7   at least one of a plurality of access gateways;
8   a network interconnecting said plurality of data centers, said directory
9   server, and said access gateway; wherein
10   responsive to input received via any of said at least one of a plurality of
11   access gateways, any of said plurality of data centers may be configured as a primary
12   (source) of data, and any of said plurality of data centers may be configured as a
13   secondary (target) of data in a copy operation.

1   2.   The system of claim 1, wherein, responsive to said input received
2   via any of said at least one of a plurality of access gateways, information about said first
3   data center and said second data center is fetched from said directory server, and
4   thereupon, said first data center may be configured as a primary (source) of data, and said
5   second data center may be configured as a secondary (target) of data in a copy operation.

1   3.   The system of claim 2, wherein, responsive to a second input
2   received via any of said at least one of a plurality of access gateways, said first data center
3   may be reconfigured as a secondary (target) of data, and said second data center may be
4   configured as a primary (source) of data in a second copy operation.

1   4.   The system of claim 3, wherein copy operations are synchronous,
2   said first data center updating contents of storage from contents of a cache memory prior
3   to being reconfigured to as a secondary (target) in said second copy operation.

1   5.   The system of claim 2, wherein said information fetched from said
2   directory server comprises proximity information for a source of said input received via
3   said at least one of a plurality of access gateways, and wherein said first data center is

4   configured as a primary (source) of data, and said second data center is configured as a

5   secondary (target) of data in said copy operation based upon said proximity information.

1   6.   The system of claim 2, wherein said plurality of data centers

2   further comprises a third data center, said third data center being configured as another

3   secondary (target) of data in a copy operation.

1   7.   The system of claim 1, further comprising a network interface that

2   provides connection between at least one of a plurality of access gateways and a user

3   terminal.

1   8.   The system of claim 1, wherein information associated with a

2   virtual volume is stored in a plurality of real volumes in said storage system.

1   9.   The system of claim 8, wherein a correspondence between said

2   virtual volume and said plurality of real volumes in said storage system is stored in said

3   directory server.

1   10.   The system of claim 1, wherein a storage volume from said first

2   data center and a storage volume from said second data center comprise a copy volume

3   group.

1   11.   The system of claim 1, said directory server further comprising a

2   log in process and a virtual volume information.

1   12.   The system of claim 1, said host server further comprising a copy

2   volume group interface process, a read request issue process, and a write request issue

3   process.

1   13.   A method, comprising:

2   receiving a virtual volume name and network interface ID for a user;

3   finding a virtual volume corresponding to said virtual volume name and

4   network interface ID;

5   selecting a real volume information corresponding to a data center to

6   which said user is logged into;

7   determining whether said data center is primary;

8   if said data center does not contain a primary volume, issuing a request to

9   change a volume within said data center to a primary volume, waiting for a response to

10   said request, re-setting a current primary volume, and setting said volume within said data

11   center to be primary; and

12   returning a real volume information for said volume within said data

13   center set to primary.

1   14.   A method, comprising:

2   receiving a request comprising a real volume address and a storage system

3   address;

4   finding a copy volume group corresponding to said real volume address

5   and said storage system address of said request;

6   finding a copy volume that is a current primary volume;

7   determining whether transfer type is synchronous;

8   if said transfer type is synchronous, then requesting that said current

9   primary volume synchronize cache, and waiting for a response;

10   issuing a request to change primary real volume;

11   waiting for a response to said request;

12   re-setting an indication that said current primary volume is primary;

13   setting an indication that said real volume address and said storage system

14   address of said request are now primary; and

15   notifying of completion.

1   15.   A method, comprising:

2   receiving write data;

3   storing said write data in cache memory;

4   determining whether a transfer type associated with said write data is

5   synchronous;

6   if said transfer type is synchronous, then sending write data to secondary

7   volume, and waiting for response; and

8   providing notification of completion.

1   16.   The method of claim 15,

2   further comprising:

3   finding a copy volume group information, including a real volume address

4   specified along with said write data.

1   17.   A method, comprising:

2   determining whether write data is stored in cache memory;

3   if write data is not stored in cache memory, waiting and then performing

4   determining whether write data is stored in cache memory again;

5   finding copy volume group information for a storage system for said write

6   data;

7   sending said write data to said storage system;

8   determining if said write data is to be sent to another storage system;

9   if said write data is to be sent to another storage system, then performing

10   said finding, sending and determining again until all write data has been sent; and

11   notifying of completion.

1   18.   The method of claim 17,

2   wherein said copy volume group information includes a real volume

3   address of a corresponding real volume.

1   19.   An apparatus, comprising:

2   at least one of a plurality of storage devices; and

3   a storage control unit, comprising:

4   a cache memory;

5   a copy volume group information;

6   a copy volume group definition process means;

7   a read request execution process means;

8   a write request execution process means;

9   a write data send process means; and

10   a write data receive process means.

1   20.   The apparatus of claim 19,

2   wherein said write request execution process means is operative to:

3   receive write data;

4   store said write data in cache memory;

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5   determine whether a transfer type associated with said write data is

6 synchronous;

7   if said transfer type is synchronous, then send write data to secondary

8 volume, and wait for response; and

9   provide notification of completion.

1   21. The apparatus of claim 19,

2   wherein said write data send process means is operative to:

3   determine whether write data is stored in cache memory;

4   if write data is not stored in cache memory, wait and then perform

5 determining whether write data is stored in cache memory again;

6   find copy volume group information for a storage system for said write

7 data;

8   send said write data to said storage system;

9   determine if said write data is to be sent to another storage system;

10   if said write data is to be sent to another storage system, then perform said

11 finding, sending and determining again until all write data has been sent; and

12   provide notification of completion.

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